REMARKS

No claims are canceled or added. Claims 46, 47, and 57 are amended. Claims 1-5, 10, and 19-63 remain in the application for consideration. In view of the following remarks, Applicant respectfully requests reconsideration and withdrawal of the rejections.

Request for Reconsideration of Petition

Applicant respectfully requests reconsideration of Applicant's petition under 37 C.F.R. § 1.84(b)(2). In Paper No. 8, the Office denied the petition because Applicant's specification did not contain the required language noted by the Office. Applicant has now amended the specification to include the required language and therefore respectfully requests reconsideration and approval of Applicant's petition.

Allowed Subject Matter

Claims 29-45 and **claims 52-63** are indicated by the Office as allowed. Applicant thanks the Office for the indication of allowable subject matter.

§ 103 Rejections

Claims 1-5 and 19-28 stand rejected under 35 U.S.C. § 103(a) over U.S. Patent No. 6,163,322 to LaChapelle.

Claim 10 stands rejected under 35 U.S.C. § 103(a) over LaChapelle in view of a document to Parke entitled *Computer Facial Animation*.

Claims 46-51 stand rejected under 35 U.S.C. § 103(a) over U.S. Patent No. 6,351,269 to Georgiev in view of Parke.

Claims 1-18

Claim 1 recites a facial expression transformation method comprising [emphasis added]:

- defining a code book containing data defining a first set of facial expressions of a first person;
- providing data defining a second set of facial expressions, the second set of facial expressions providing a training set of expressions of a second person who is different from the first person;
- deriving a transformation function from the training set of expressions and ***corresponding expressions*** from the first set of expressions; and
- applying the transformation function to the first set of expressions to provide a synthetic set of expressions.

In making out the rejection of this claim, the Office argues that LaChapelle discloses the recited act of "deriving" at column 9, lines 43-51. Specifically, the Office argues that "[i]t is inherent that the transformation function in the mapping template is derived because for this transformation to work, the transformation function would have to be different for each pair of performer's faces and database entries." The cited excerpt is reproduced below [emphasis added]:

> Following the modelization stage 100, the registration stage 102 maps markers located on a live performer, preferably ***with the performer's face in his natural position***, onto points on the neutral facial expression E_0 of the model in the synthetic coordinate space. This projection, herein referred to as the mapping template, takes into account the ***geometric scaling discrepancies between the synthetic character model and the actor's face*** in the case where the markers are placed on an actor's face.

As discussed in the cited excerpt, LaChapelle's system maps markers from the performer's face to the neutral facial expression of the model. This mapping between ***only one expression***, i.e., the performer's "natural expression," and the neutral facial expression of the synthetic model takes into account ***only*** the geometric scaling discrepancies between the synthetic character model and the actor's face. This point is stressed just after the cited excerpt in column 9, lines 51-54, reproduced below [emphasis added]:

> This scaled projection forms ***the link*** between the synthetic character and the performer and allows transferring proper marker displacements to the system.

Thus, LaChapelle appears to map ***only one*** expression from his live performer to the synthetic character. This constrains him to take into account ***only*** the geometric scaling discrepancies between the performer and the synthetic character. In contrast, Applicant derives a transformation function from the training set of expressions to (***multiple***) ***corresponding expressions*** from the first set of expressions. This allows Applicant to take into account ***more than*** just static discrepancies between the proportions of the performer and the synthetic character. Applicant's claimed subject matter is capable of compensating for ***dynamic*** differences in the manner in which different people make the same expression. As LaChapelle neither discloses nor suggests any such subject matter, this claim is allowable.

Claims 2-5 and 10 depend from claim 1 and are allowable as depending from an allowable base claim. These claims are also allowable for their own recited features which, in combination with those recited in claim 1, are neither disclosed nor suggested in the references of record, either singly or in combination

with one another. Given the allowability of claim 1, the rejection of claim 10 over the combination with Parke is not seen to add anything of significance.

Claims 19-23

Claim 19 recites one or more computer-readable media having computer-readable instructions thereon which, when executed by a computer, cause the computer to [emphasis added]:

- operate on a training set of expressions from one person and corresponding expressions from a code book of another person to compute a linear transformation function from the training set and ***their corresponding expressions***; and
- apply the transformation function to a plurality of expressions from the code book to provide a synthetic set of expressions.

In making out the rejection of this claim, the Office argues that LaChapelle computes a linear transformation function from the training set and their corresponding expressions at column 9, lines 43-51, which was reproduced above.

As discussed in the cited excerpt, LaChapelle's system maps markers from the performer's face to the neutral facial expression of the model. This mapping between ***only one expression***, i.e., the performer's "natural expression," and the neutral facial expression of the synthetic model takes into account ***only*** the geometric scaling discrepancies between the synthetic character model and the actor's face. This point is stressed just after the cited excerpt in column 9, lines 51-54, reproduced below [emphasis added]:

> This scaled projection forms ***the link*** between the synthetic character and the performer and allows transferring proper marker displacements to the system.

Thus, LaChapelle appears to map ***only one*** expression from his live performer to the synthetic character. This constrains him to take into account ***only*** the geometric scaling discrepancies between the performer and the synthetic character. In contrast, Applicant computes a linear transformation function from the training set and ***their*** (***multiple***) ***corresponding expressions***. This allows Applicant to take into account ***more than*** just static discrepancies between the proportions of the performer and the synthetic character. Applicant's claimed subject matter is capable of compensating for ***dynamic*** differences in the manner in which different people make the same expression. As LaChapelle neither discloses nor suggests any such subject matter, this claim is allowable.

Claims 20-23 depend from claim 19 and are allowable as depending from an allowable base claim. These claims are also allowable for their own recited features which, in combination with those recited in claim 19, are neither disclosed nor suggested in the references of record, either singly or in combination with one another.

Claims 24-28

Claim 24 recites a facial expression transformation system comprising [emphasis added]:

- a code book embodied on a computer-readable medium, the code book containing data defining a first set of facial expressions of a first person;
- data embodied on a computer-readable medium, the data defining a second set of facial expressions, the second set of facial expressions providing a training set of expressions of a second person who is different from the first person; and

- a transformation processor configured to derive a transformation function from the training set of expressions and ***corresponding expressions*** from the first set of expressions.

In making out the rejection of this claim, the Office argues that LaChapelle discloses the claimed transformation processor at column 9, lines 43-51, which was reproduced above.

As discussed in the cited excerpt, LaChapelle's system maps markers from the performer's face to the neutral facial expression of the model. This mapping between ***only one expression***, i.e., the performer's "natural expression," and the neutral facial expression of the synthetic model takes into account ***only*** the geometric scaling discrepancies between the synthetic character model and the actor's face. This point is stressed just after the cited excerpt in column 9, lines 51-54, reproduced below [emphasis added]:

> This scaled projection forms ***the link*** between the synthetic character and the performer and allows transferring proper marker displacements to the system.

Thus, LaChapelle appears to map ***only one*** expression from his live performer to the synthetic character. This constrains him to take into account ***only*** the geometric scaling discrepancies between the performer and the synthetic character. In contrast, Applicant's transformation processor is configured to derive a transformation function from the training set of expressions and ***(multiple) corresponding expressions*** from the first set of expressions. This allows Applicant to take into account ***more than*** just static discrepancies between the proportions of the performer and the synthetic character. Applicant's claimed subject matter is capable of compensating for ***dynamic*** differences in the manner in which different

people make the same expression. As LaChapelle neither discloses nor suggests any such subject matter, this claim is allowable.

Claims 25-28 depend from claim 24 and are allowable as depending from an allowable base claim. These claims are also allowable for their own recited features which, in combination with those recited in claim 24, are neither disclosed nor suggested in the references of record, either singly or in combination with one another.

Claim 46

As amended, **claim 46** recites a method of animating facial features comprising [emphasis added]:

- defining a subdivision surface that approximates geometry of a plurality of different faces;
- fitting the same subdivision surface for ***only one expression*** to each of the plurality of faces to establish a correspondence between the faces for a ***plurality of expressions***; and
- using the correspondence between the faces to transform an expression of one face into an expression of another face.

In making out the rejection of this claim, the Office admits that Parke, the now-secondary reference, does not disclose fitting the same subdivision surface to each of the plurality of faces to establish a correspondence between the faces and using the correspondence between the faces to transform an expression of one face into an expression of another face. Applicant agrees.

The Office then relies on Georgiev and cites to column 4, lines 47-61, as disclosing these elements. The cited excerpt is reproduced below:

> Turning now to FIG. 6, an example of a transformation which "transports" a facial expression from an image of one person to another is shown. Given an original face 300, which is not smiling, and a smiling face 302 of the same person, a new face 304 of another person can be morphed to simulate the second person's smiling in exactly the same way as the original face 300. In this example, a 2-D morph space for a 3-image morphing (the 3 input images being 300, 302 and 304) is determined by finding the change vector 301 from the neutral face 300 to the smiling face 302 and by applying the 3-image morphing to add the change to the new face 304. The result is a smiling new face 306. By scaling the change vector we can achieve any degree of smiling, even "inverse smiling". The change vector 301 may be applied to any other images.

Specifically, the Office argues that "the 'subdivision surface' is the 3-image morphing in l.57. The 3-image morphing is a 'subdivision surface' because any given morphing constitutes a 'subdivision' of different expressions (see col. 4, ll. 36-43). The 'correspondence between the faces' is the 'transport' of a facial expression from one image to another (see col. 4, ll. 47-49). Finally, the same subdivision surface can be applied to a plurality of faces using the change vector (see col. 4, ll. 60-61)."

Applicant respectfully submits that the Office appears to misinterpret what is meant by the term "subdivision surface" and its context in this claim.

In order to aid the Office in appreciating the patentable distinctions between Georgiev's "change vector" and Applicant's claimed subject matter, the Office's attention is respectfully drawn to the specification starting at page 27, line 9, and continuing through page 28, line 10, which describes *but one way* of implementing the claimed method. This excerpt from the specification is reproduced below [emphasis added]:

> Fig. 10 is a flow diagram that describes steps in a method for building a face model in accordance with this described embodiment. The method can

be implemented in any suitable hardware, software, firmware or combination thereof. In the present example, the method is implemented in software.

Step 1000 measures 3D data for one or more faces to provide corresponding face models. In the above example, the 3D data was generated through the use of a laser range scan of the faces. It will be appreciated that any suitable method of providing the 3D data can be used. Step 1002 defines a generic face model that is to be used to fit to the one or more face models. It will be appreciated that the generic face model can advantageously be utilized to fit to many different faces. Accordingly, this constitutes an improvement over past methods in which this was not done. In the example described above, the generic face model comprises a mesh structure in the form of a coarse triangle mesh. The triangle mesh defines subdivision surfaces that closely approximate the geometry of the face. ***In the illustrated example, a single base mesh is used to define the subdivision surfaces for all of the face models.*** Step 1004 selects specific points or constraints on the generic face model. These specific points or constraints are mapped directly to corresponding points that are marked on the face model. The mapping of these specific points takes place in the same manner for each of the many different possible face models. Step 1006 fits the generic face model to the one or more face models. This step is implemented by manipulating only the positions of the vertices to adapt to the shape of each different face. During the fitting process continuous optimization is performed only over the vertex positions so that the connectivity of the mesh is not altered. In addition, the fitting process involves mapping the specific points or constraints directly to the face model. In addition, a smoothing term is added and minimized so that the control mesh is encouraged to be locally planar.

Applicant has amended this claim in an attempt to further clarify that claim 46 involves fitting the same subdivision surface for ***only one expression*** to each of the plurality of faces to establish a correspondence between the faces for a ***plurality of expressions***. Neither Georgiev's change vector, nor any other aspect of his system, discloses or suggests fitting the same subdivision surface for ***only one expression*** to each of the plurality of faces to establish a correspondence between the faces for a ***plurality of expressions***.

Accordingly, for at least this reason, this claim is allowable.

Claims 47-51

As amended, **claim 47** recites a method of animating facial features comprising [emphasis added]:

- measuring 3-dimensional data for a plurality of different faces to provide corresponding face models;
- defining only one generic face model that is to be used to map to each corresponding face model;
- selecting a plurality of points on the generic face model that are to be mapped directly to corresponding points on each of the corresponding face models; and
- fitting the generic face model to each of the corresponding face models for ***only one expression*** to establish a correspondence between the faces for a ***plurality of expressions***, said fitting comprising mapping each of the selected points directly to the corresponding points on each of the corresponding face models.

In making out the rejection of this claim, the Office argues that Georgiev discloses the recited act of fitting at column 4, lines 60-61. The cited excerpt is reproduced below:

> The change vector may be applied to any other images.

Applicant has amended this claim in an attempt to further clarify that the recited act of fitting comprises fitting the generic face model to each of the corresponding face models for ***only one expression*** to establish a correspondence between the faces for a ***plurality of expressions***. Neither Georgiev's change vector, nor any other aspect of his system, discloses or suggests fitting the generic

face model to each of the corresponding face models for ***only one expression*** to establish a correspondence between the faces for a ***plurality of expressions***, where the fitting comprises mapping each of the selected points directly to the corresponding points on each of the corresponding face models.

Accordingly, for at least this reason, this claim is allowable.

Claims 48-51 depend from claim 47 and are allowable as depending from an allowable base claim. These claims are also allowable for their own recited features which, in combination with those recited in claim 47, are neither disclosed nor suggested in the references of record, either singly or in combination with one another.

Conclusion

All of the claims are in condition for allowance. Accordingly, Applicant requests a Notice of Allowability be issued forthwith. If the Office's next anticipated action is to be anything other than issuance of a Notice of Allowability, Applicant respectfully requests a telephone call for the purpose of scheduling an interview.

Respectfully Submitted,

Dated: 3/31/07

By: _____

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